DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE
INTERAGENCY BISON MANAGEMENT PLAN
FOR STATE OF MONTANA AND YELLOWSTONE NATIONAL PARK

Bison are an essential component of Yellowstone National Park because they contribute to the biological, ecological, cultural, and aesthetic purposes of the park. However, Yellowstone National Park is not a self-contained ecosystem for bison, and periodic migrations into Montana are natural events. Some bison have brucellosis and may transmit it to cattle outside the park boundaries in Montana. Left unchecked, the migration of brucellosis-infected bison from Yellowstone National Park into Montana could have not only direct effects on local livestock operators, but also on the cattle industry statewide. The cooperation of several agencies is required to fully manage the herd and the risk of transmission of brucellosis from bison to Montana domestic cattle.

The purpose of the proposed interagency action is to maintain a wild, free-ranging population of bison and address the risk of brucellosis transmission to protect the economic interest and viability of the livestock industry in the state of Montana.

The U.S. Department of the Interior, National Park Service, and the U.S. Department of Agriculture, Forest Service, are the federal lead agencies. The state of Montana is the state lead. The U.S. Department of Agriculture, Animal and Plant Health Inspection Service, is a cooperating agency.

This environmental impact statement examines seven alternative means of minimizing the risk of transmitting the disease brucellosis from bison to domestic cattle on public and private lands adjacent to Yellowstone National Park. These alternatives each include a full range of management techniques, although they focus on one or two in particular. For instance, alternative 3 manages the bison herd primarily through hunting but includes provisions for quarantine. Alternative 5 proposes an extensive capture, test, and slaughter of bison that test positive for brucellosis. Alternative 6 is similar to alternative 5 but requires 10 years of vaccination before the test and slaughter phase begins. Alternative 1 is the no-action alternative. It continues the present plan of capture and slaughter of all bison crossing the north end and most bison crossing the west boundary of the park. Alternative 4 is similar to alternative 1, but would add quarantine, so that bison testing negative for brucellosis would not be slaughtered. Alternative 2 centers on changes in cattle operations and allows bison to range over the largest portion of their historic range. Alternative 7, the agencies' preferred alternative, focuses on maintaining the bison population below about 2,500 animals to minimize migration into Montana. Alternatives 2, 3, and 7 also include a framework for considering the acquisition of lands from willing sellers for use as winter range and for other bison management activities. Decisions to implement management actions on acquired lands will be supported with additional National Environmental Policy Act and/or Montana Environmental Policy Act analyses.

Implementation of the preferred alternative would result in adverse impacts on the bison population size, wildlife viewing opportunities, social values of some people, groups, or tribes, a few ranchers using public allotments on the Gallatin National Forest should those allotments be closed, wildlife species (particularly the pronghorn antelope, grizzly bear, and gray wolf), and visual resources of the area. Other alternatives might have these same impacts but could also affect winter recreation (particularly snowmobiling), nonmarket values, livestock operations, public funds (to acquire winter range), the trumpeter swan, bald eagle, lynx, and wolverine, and the historic landscape of the area. Alternative 2 would have significant beneficial impacts associated with the nonmarket values attributed to the well-being of bison, while this alternative would also present the greatest potential for the transmission of brucellosis from bison to cattle. Were that to occur, there would be major negative economic effects on Montana's livestock industry. Alternatives 2, 3, and 7 would have significant benefits for ungulates (elk, deer, pronghorn, and bison) if additional winter range could be acquired. Mitigating measures and some monitoring would be needed to avoid impacts on threatened or endangered species in alternatives 5 and 6.

Written comments on this draft environmental impact statement will be taken for a period of 120 days. The review period for this document ends October 1, 1998. Comments should be sent to Sarah Bransom, Interagency Bison Management Plan, DSC-RP, P.O. Box 25287, Denver, CO 80225-0287

INTRODUCTION

PROPOSED ACTION

This environmental impact statement analyzes impacts of several different alternatives for the interagency, long-term management (assumed for purposes of analysis to be 15 years) of Yellowstone area bison to ensure domestic cattle in portions of Montana adjacent to Yellowstone National Park are protected from brucellosis, a disease some of these bison carry, and to ensure the viability of the bison herd. Each alternative requires the cooperation of the U.S. Department of the Interior's National Park Service (NPS), the state of Montana, and the U.S. Department of Agriculture's Forest Service (USFS) and Animal and Plant Health Inspection Service (APHIS), as all have jurisdiction over a portion of the management effort, either directly or indirectly. At this time alternative 7, maintaining a specific bison population range, is the agencies' preferred means of management.

PROJECT LOCATION

The analysis area is a part of what is often described as the Greater Yellowstone Area, the largest and most nearly intact ecosystem in the contiguous United States (Greater Yellowstone Coordinating Committee 1991). The portion specifically subject to analysis includes those areas in Yellowstone National Park habitually occupied by bison (approximately 1.75 million acres) and adjacent federal, state, and private lands outside the park in southwestern Montana (parts of Park and Gallatin Counties) that have been periodically occupied by Yellowstone bison over the past 12 years.

The area outside the park includes approximately 568,994 acres, of which about 97% is managed by Gallatin National Forest, 1% by state or local government, and 2% by private owners.

NEED FOR ACTION

Bison are an essential component of Yellowstone National Park because they contribute to the biological, ecological, cultural, and aesthetic purposes of the park. However, Yellowstone National Park is not a self-contained ecosystem for bison, and periodic migrations into Montana are natural events. Some bison have brucellosis and may transmit it to cattle outside the park boundaries in Montana. As bison migrate out of the park and into Montana, they move from one jurisdiction with management objectives to a different jurisdiction with different management objectives. Therefore, the cooperation of several agencies is required to fully manage the herd and the risk of transmission of brucellosis from bison to Montana domestic cattle.

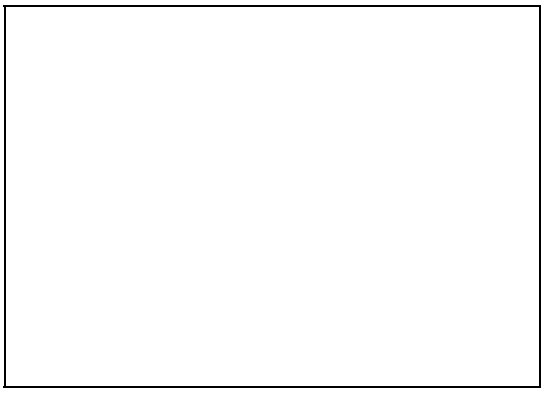

Photo 1: *Bison exiting Yellowstone National Park through north entrance near Gardiner, Montana.*

PURPOSE OF ACTION

The purpose of the proposed interagency action is to maintain a wild, free-ranging population of bison and address the risk of brucellosis transmission to protect the economic interest and viability of the livestock industry in the state of Montana.

BACKGROUND

The Yellowstone Area Bison Herd

Bison are native to the Greater Yellowstone Area and were observed there by early travelers both before and after the creation of Yellowstone National Park in 1872 and the Yellowstone Timber Land Reserve in 1891.

Hunting and poaching of bison in the late 1800s substantially reduced the number of bison in the Yellowstone herd, and by 1902, only 23 were counted. Fearful the small wild herd might vanish, park managers imported 21 bison from captive herds into the park. These bison were raised using livestock techniques on the "Buffalo Ranch" in Lamar Valley until the 1930s, when the National Park Service gradually began efforts to restore the bison to a more natural distribution (NPS, USDI, Meagher 1973). However, artificial feeding of the Lamar Valley herd, herd reductions to achieve range management goals, and other manipulation of the population continued from the 1920s until the late 1960s, and were often quite intensive. The highest reported bison count during this period was 1,477 in 1954.

In 1967, when herd reductions in the park ceased as part of a larger redirection of park policies, 397 bison were counted. Since that time bison, elk, and other animals have been allowed to reach population levels dictated by environmental conditions.

In 1968, in response to livestock industry concerns over brucellosis, the National Park Service proposed a program to control bison at the boundary of the park. More recently, a series of four interim bison management plans (the latest in 1996) put specific boundaries and lethal control measures in place. In 1996–97, a particularly harsh winter with deep snow and ice conditions sent hundreds of bison toward park boundaries, seeking accessible forage at lower elevations. Implementation of the interim plan, combined with the severe winter conditions, resulted in the slaughter or shooting of 1,084 bison in the five months between November 14, 1996, and April 15, 1997. Others died of starvation or other natural causes inside the park, bringing the total population down from an estimated 3,500 in fall 1996 to an estimated 2,000 animals by early spring 1997.

Brucellosis in Cattle and Bison

Brucellosis is a contagious bacterial disease, caused by various species of the genus, *Brucella*, that infects domestic animals, wildlife, and humans worldwide. *Brucella abortus* is the species that infects both cattle and bison. There is no cure for brucellosis. Vaccines developed so far are not 100% effective, and are to date less effective with bison than with cattle. The first known case of brucellosis in the bison herd was reported in 1917. It is generally agreed that the transmission of brucellosis to the Yellowstone bison herd was from cattle, and occurred either through contact with infected cattle or from infected cows' milk fed to captive bison calves.

In cattle, the organism is shed primarily in aborted tissues, reproductive tissues, and discharges, especially just before, during, or soon after abortion or live birth. Ingestion by other cattle of contaminated material is the primary route of infection. Cows infected with brucellosis characteristically abort their first calf after the fifth month of gestation.

Less is known about the disease in bison, particularly free-ranging bison. Transmission from bison to cattle has occurred under experimental conditions in confined spaces, but has not been documented under free-ranging conditions.

Diagnosis. In cattle, diagnosis is based on the results of blood tests, herd history, clinical signs, and other information. The only sure way to know if an animal has the disease is to slaughter it and culture tissues from several locations for bacteria. In Yellowstone bison, agencies have used a blood test for the presence of *Brucella* antibodies. For a number of reasons, these blood tests tend to overestimate the number of bison actually

harboring the bacteria. Difficulties in isolating the bacteria from tissues and other factors have also meant fewer positive culture tests than the number of infected bison.

Risk of Transmission. Scientists and researchers disagree on even some of the most basic factors influencing the risk of transmission. These include whether studies on cattle are applicable to bison, whether controlled studies are applicable in the field, and the best ways to conduct additional research to determine the risk of transmission.

These disagreements and a paucity of information on brucellosis in bison make it impossible to quantify the risk of *B. abortus* transmission from bison (and elk, although this environmental impact statement does not analyze brucellosis in elk) in the Yellowstone area to domestic livestock. Instead, the agencies have identified factors that affect risk. They include the following:

1. The degree of association between potentially infectious and susceptible animals. Management actions emphasize separation to minimize risk.

2. The number and density of infectious animals in the host population.

3. The number of susceptible animals that may associate with infectious animals.

4. Environmental factors such as weather, sunlight, and other factors that determine the viability of the organism outside its host.

5. The class of the infectious animals. Because the disease is transmitted in cattle through ingestion of contaminated birth materials, pregnant bison are considered higher risk than other classes.

6. Vaccination and neutering reduce the transmission of the disease.

7. Some animals are naturally resistant to infection.

Alternative Interpretation of Risk. The above information represents areas where scientists generally agree on the interpretation of available data. However, considerable debate and need for additional research remain. The bulk of brucellosis research and disease management has focused on domestic livestock, yet limited published information suggests the disease may be transmitted differently and have different clinical, pathological, and population effects in bison (Williams, Cain, and Davis 1994; Meyer and Meagher 1995a).

Those who suggest the risk is negligible point out that there have been no documented cases of brucellosis transmission from wild, free-ranging bison to cattle.

It is possible that, although brucellosis may be endemic in the Yellowstone area bison herd, few of the animals are capable of transmitting the disease. This suggestion is supported by noting the discrepancy between the number of bison that test seropositive for brucellosis but culture tissue negative (Rhyan et al. 1997). This discrepancy and the infrequency of observed abortions in the Yellowstone bison herd (usually required for transmission of the disease between cattle) has led to the theory that the primary route of transmission among cattle (abortions and birthing events) may be different from that among bison. In bison, the bacteria may be transmitted through milk (Meyer and Meagher 1995a).

Bison Distribution

The Yellowstone bison population uses three different wintering areas in the park: Pelican Valley (the smallest), Mary Mountain (the largest, in the Hayden Valley-Firehole River area), and the northern range. Yellowstone National Park grooms roads in the winter for snowmobile use, which allows bison to easily traverse the park. Bison seem to use the roads to exit in severe winters, such as the 1975–76 and 1996–97 winters, and retain the memory of the access routes (Meagher 1989a). While experts agree that bison traveling on groomed routes are traveling in

a more energy-efficient manner than bison traveling through deep snow, there is disagreement about what bison would do if grooming ceased. What result this would have on bison numbers and distribution is not known. Bison migrate across the north and west ends of the park during the winter into Montana. In the north they exit primarily across the Reese Creek boundary of Yellowstone National Park, and move immediately onto adjacent private land where several hundred cattle are present year-round.

Bison may also enter national forest land in the Eagle Creek/Bear Creek area east of Reese Creek, where they occasionally enter private lands in the Gardiner area by traveling along the Maiden Basin hydrographic divide and Little Trail Creek drainage. These lands are collectively referred to as the Eagle Creek/Bear Creek "special management area" (areas outside the park where bison are allowed) in this document. To the east of these lands (and north of the park) lie Hellroaring and Slough Creek drainages and the Absaroka-Beartooth Wilderness, part of the national forest where cattle are not present. A few bison use these higher elevation, more rugged lands in winter and summer.

From the west side of the park, bison move along the Madison River, Duck Creek, and Cougar Creek in the vicinity of West Yellowstone. From here, bison infrequently move north (usually along Highway 191) onto public lands administered by the U.S. Forest Service in the Cabin Creek Recreation and Wildlife Management Area and the Monument Mountain Unit of the Lee Metcalf Wilderness. The western special management area (SMA) in this document includes these lands south to the West Yellowstone area. Up to a few hundred cattle may occupy select public and private lands in the West Yellowstone area in the summer months. No cattle are present in the winter.

Economic Impacts of Brucellosis in Cattle

Brucellosis (*B. abortus*) has the following direct impacts on the livestock industry:

- Abortion of calves
- Decreased weight gain by calves
- Delays in calf production
- Increased rates of culling and replacement
- Increased testing and vaccinating costs

The presence of livestock disease may also affect each state's classification by the Animal and Plant Health Inspection Service. Montana is currently "class-free" and can transport its cattle across state lines without testing for brucellosis. Downgrading would have extensive economic ramifications throughout the livestock industry in Montana by restricting ranchers' access to interstate and international livestock markets. Interstate limits on Montana producers' ability to market livestock may also come about from actions of state veterinarians whose states import Montana cattle and who see Yellowstone cattle as a potential disease threat. The potential for such widespread economic consequences is a primary motivating factor in taking management actions described in the alternatives in this environmental impact statement.

OBJECTIVES AND CONSTRAINTS IN TAKING ACTION

In addition to the above-stated purpose, the agencies have agreed that nine objectives would guide them in determining whether an alternative is reasonable, and in selecting the preferred alternative. Each alternative must meet the following objectives:

1. Address bison population size and distribution; have specific commitments relating to size of bison herd.

2. Clearly define a boundary line beyond which bison will not be tolerated.

3. Address the risk to public safety and private property damage by bison.

4. Commit to the eventual elimination of brucellosis in bison and other wildlife.

5. Protect livestock from the risk of brucellosis.

6. Protect the state of Montana from risk of reduction in its brucellosis status.

7. At a minimum, maintain a viable population of wild bison in Yellowstone National Park, as defined in biological, genetic, and ecological terms.

8. Be based on factual information, with the recognition that the scientific database is changing.

9. Recognize the need for coordination in the management of natural and cultural resource values that are the responsibility of the signatory agencies.

Another important factor in deciding the reasonableness of alternatives are agency constraints imposed by laws, regulations, or other requirements. All alternatives must be within these constraints to be a viable choice. A summary of legislative and regulatory requirements of each of the four agencies involved in bison management is provided in part 1, "Purpose of and Need for Action."

ISSUES

Public scoping identified several environmental problems (issues) that should be addressed in a cooperative bison management plan. Scoping also identified other objectives and alternatives the public wished agencies to consider in their planning. The resources that agencies believed would experience more than negligible impacts are listed below, and each is analyzed in the environmental impact statement:

- the Yellowstone area bison population size, distribution, and seroprevalence
- recreation
- socioeconomics, including the regional economy, minority and low-income populations, social values, and nonmarket values
- livestock operations in the region
- threatened and endangered species, such as the grizzly bear, and sensitive species or species of special concern
- other wildlife
- human safety
- cultural resources
- visual resources

SUMMARY OF ALTERNATIVES AND IMPACTS

FEATURES COMMON TO ALL ALTERNATIVES

This environmental impact statement evaluates seven alternatives for the long-term management of bison. Alternative 1 is the no-action alternative (continue with existing interim plan), and alternative 7 (manage for specific bison population range) is the agencies' preferred alternative at this time. Each of the seven alternatives has several features in common, including the following:

- All alternatives require the cooperation of the state of Montana, the U.S. Forest Service, the National Park Service, and the Animal and Plant Health Inspection Service.
- Every alternative envisions the bison population would be managed primarily through natural processes inside Yellowstone National Park.
- In all alternatives (except alternative 5 in the short term), the use of lethal controls to manage bison is minimized as the population size approaches 1,700 animals.
- All alternatives include large geographic areas where bison are able to range with little human intervention. In alternative 5, this area is limited to Yellowstone National Park.
- Monitoring is an integral part of every alternative, especially as bison approach designated border areas in Montana.
- All alternatives define a management boundary beyond which agencies would take action to ensure bison do not remain.
- If a capture facility is sited as part of an alternative, it would meet certain environmental criteria and comply with requirements of the Endangered Species Act and the National Historic Preservation Act before construction began.
- All alternatives include humane treatment of bison held in capture or quarantine facilities.
- All alternatives except alternative 5 allow bison outside the park. To do so and not affect Montana's class-free status, special management areas (SMAs) would be created. The creation of these SMAs would not require changes to current APHIS regulations, but would require the approval of the state of Montana as specified by Montana law.
- Slaughtered bison could be auctioned or distributed to social service organizations. Bison shot in the field may be released to tribes. Live bison would be available if they had completed the approved quarantine protocol.
- In Montana, private landowners may shoot bison on their land with permission from the Department of Livestock, or they may ask the department to remove bison.
- All alternatives include the suggested vaccination of female cattle calves in areas adjacent to the park or in SMAs, as well as surveillance testing of these herds should contact with bison be suspected or occur. All alternatives also assume vaccination of bison calves and captured adult bison when a safe and effective vaccine is available.
- All alternatives include future research efforts.

ALTERNATIVE 1: NO ACTION – CONTINUATION OF THE CURRENT INTERIM BISON MANAGEMENT PLAN

Adopting this alternative would continue current bison management as set forth in the 1996 *Interim Bison Management Plan* as defined by

National Environmental Policy Act (NEPA) guiding regulations (40 CFR 1502.14). The interim plan relies on strict border enforcement to keep bison and cattle separate, and has no provision for the quarantine of bison. Bison are prevented from crossing the northern park boundary at Reese Creek because the adjacent land is private and occupied by cattle throughout the year. All bison captured at the Stephens Creek facility are shipped to slaughter.

Bison are allowed in the Eagle Creek/Bear Creek area, a large tract of public (U.S. Forest Service) land north and east of Reese Creek. The Department of Livestock, with help from the agencies, maintains a boundary at Little Trail Creek/Maiden Basin hydrographic divide in the Eagle Creek/Bear Creek area. Bison moving north of this boundary and approaching private land in the Gardiner area are removed by agency personnel with the permission of the landowner.

In the West Yellowstone area, public lands administered by the U.S. Forest Service are adjacent to the park. Cattle are more dispersed than at Reese Creek and are not grazed during the winter months. Up to 50–100 seronegative nonpregnant bison in the West Yellowstone area are able to overwinter successfully outside the park without coming in contact with cattle. Seropositive, untested, or any pregnant bison are removed. Bison are excluded from the West Yellowstone area from May through October to prevent contact while cattle occupy the region. Bison located outside the park in the west boundary area would be hazed back into the park in the spring, 30 to 60 days before cattle occupy the area. The exact number of days, between 30 and 60, would be at the discretion of the state veterinarian. Those bison that could not be hazed back into the park would be shot. In addition, a handful of bison (usually single bulls) use the Cabin Creek/Lee Metcalf area on the west, or Hellroaring and Slough drainages to the north and east of Eagle Creek/Bear Creek. Those few that do move beyond the borders of either of these large tracts of public land would be hazed or shot.

Although agencies have made subsequent changes to the interim plan, these are not reflected in the description or analysis of the no-action alternative. In other words, existing conditions were assumed to begin when the analysis in this environmental impact statement began in spring 1997.

ALTERNATIVE 2: MINIMAL MANAGEMENT

The purpose of this alternative is to restore as near-natural conditions as possible for bison, including a small portion of their historic nomadic migration patterns. The area outside Yellowstone National Park over which bison would be able to range (e.g., the SMAs) without interference from agencies is the largest of all alternatives.

In each alternative, including alternative 2, many changes, such as land acquisition, changes in cattle operations, and a safe and effective bison vaccine, are described. Each of these involves some unknowns, as well as time to implement. Therefore, until these changes were in place, relevant management tools in the interim plan would remain in effect. The description below assumes these changes have been made.

The primary means to minimize the risk of disease transmission would be changes in cattle operations in the SMAs. This alternative would provide for lethal control of bison only in cases where human safety was in immediate danger, on private property at the request of the landowner, or outside the SMA border. Bison would not be captured or slaughtered by agencies. A key tool available to restore natural conditions and help control bison distribution would be the closure (e.g., discontinuing grooming) of winter groomed roads in Yellowstone National Park that the animals now use to traverse the park. Bison have “discovered” these pathways from the interior to both the northern and western boundaries of the park, and can use them routinely during the winter to access areas they would otherwise have more difficulty reaching. It is hypothesized that the energetic cost of traveling long distances on

groomed roads would be low, and they in effect could be allowing bison to access other foraging areas, leave the interior, and move to boundary areas. Alternative 2 would be the only alternative to propose changes in winter operations in some segments of park roads to control bison distribution, although other alternatives include research on the use of roads and potential barriers to bison travel (alternative 3), and plowing to access capture facilities (alternatives 5 and 6).

In addition to leaving road segments ungroomed, the agencies would maintain boundary lines through hazing and shooting. Landowners could request bison on their property be removed, or could shoot them with permission of the Montana Department of Livestock. Cattle operators on private lands inside designated SMAs might be offered incentives to remove susceptible (breeding) cattle, or grazing rights, easements, or property in bison winter range might be purchased from willing sellers to remove cattle altogether. In addition, public grazing allotments might be modified to accommodate bison.

ALTERNATIVE 3: MANAGEMENT WITH EMPHASIS ON PUBLIC HUNTING

Alternative 3 would rely on hunting of bison to regulate population numbers and distribution of bison outside the park, and on separation of bison in time and space to preclude contact of bison with cattle. Where hunting was infeasible or inappropriate, capture and shipment of sero-positive bison to slaughter and seronegative bison to quarantine would be used to maintain separation and manage the risk of disease transmission. As in other alternatives, bison would be vaccinated when a safe and effective vaccine was developed to further reduce this risk. This alternative would have both a distinct short-term (phase 1) and a long-term (phase 2) management strategy.

In the short term, the separation of cattle and bison on the northern (Reese Creek) boundary would be maintained through capture at Stephens Creek and the shipment of seropositives to slaughter and seronegatives to quarantine (or slaughter until the quarantine facility was built). Under the provisions of the interim management plan, the agencies now ship some of the bison captured at Stephens Creek to slaughter. A quarantine facility would give the agencies flexibility in the disposition of seronegative bison they do not now have.

Bison that completed the entire quarantine procedure would be shipped live to requesting tribes or organizations, or used to repopulate herds on public lands. The location, design, and operation of a quarantine facility has not been determined, and an appropriate range of alternatives with different features would be evaluated before one was built. Additional NEPA and other compliance would be required to build such a facility on federal land or use federal money. Until the time a quarantine facility was constructed (assumed for the purposes of analysis to begin in 1999), all seronegative bison captured at Stephens Creek would be sent to slaughter.

The Department of Livestock, with help from the agencies, would maintain a boundary at Little Trail Creek/Maiden Basin hydrographic divide similar to alternative 1. Bison moving north of this boundary would be removed by agency personnel with the permission of the landowner.

Bison would be hazed back into the park in the spring, 30 to 60 days before cattle occupy the area. The exact number of days, between 30 and 60, would be at the discretion of the state veterinarian. Those bison that could not be hazed back into the park would be shot. As in alternatives 1 and 4, agencies would also maintain a boundary at the north end of the Cabin Creek Recreation and Wildlife Management Area/Monument Mountain Unit of the Lee Metcalf Wilderness. Hunting would be used in both the Eagle Creek/Bear Creek and western SMAs to help control population numbers and distribution. Research on the degree to which the winter grooming of park roads contributed to migration out of the park would continue, and changes in road grooming practices would be made in the long term if research showed they

were warranted. These changes would be implemented through amendments to the park's winter use plan and appropriate NEPA documentation.

In the long term, alternative 3 would call for acquisition of bison winter range through purchase of grazing rights, easements, or property from willing sellers, alterations in cattle allotments, and/or changes in livestock operations to remove susceptible cattle. This newly acquired winter range would be designated as the Reese Creek SMA, and would include lands on the west side of the Yellowstone River between Reese Creek and Yankee Jim Canyon. If suitable land north of the park was acquired through purchase or easement, the Stephens Creek capture facility might be moved to a different location. The Department of Livestock, with help from the agencies, would maintain a boundary at Yankee Jim Canyon, and hunting in the Reese Creek SMA would be used to help control population size and distribution of the bison herd.

If this alternative was selected, the agencies would request the 1999 Montana Legislature to authorize a fair-chase hunt for bison. Public hunting would then become the primary tool for agencies to control population sizes in the new Reese Creek SMA, and would also be allowed in the Eagle Creek/Bear Creek area and western SMA.

Modifications in grazing allotments, acquisition or easement of private land, or conversion from cow-calf to steer or spayed heifer production are options in this alternative for the West Yellowstone area to further reduce the risk of bison commingling with susceptible cattle.

ALTERNATIVE 4: INTERIM PLAN WITH LIMITED PUBLIC HUNTING AND QUARANTINE

The interim plan (no action, or alternative 1 in this analysis) has served to ensure spatial separation of the bison herd from domestic cattle on the northern and western borders of Montana. However, it has given agencies few options when harsh winters force more than the average number of bison toward the boundaries of Yellowstone National Park. For this reason, alternative 4 includes a quarantine facility to preserve sero-negative bison captured at Stephens Creek. Bison completing the quarantine protocol would be released to tribes, requesting organizations, or to repopulate herds on public lands. The location of the facility has not been determined, and locating it on federal land or using federal money would mean subsequent NEPA analysis, including public input, would be required.

Hunting, should it be approved by the Montana Legislature, would be another tool proposed to help agencies control population numbers and distribution. A limited hunt, primarily for recreation, would be allowed in the West Yellowstone and Eagle Creek/Bear Creek areas.

Except for these differences, alternative 4 would be identical to the interim management plan, alternative 1.

ALTERNATIVE 5: AGGRESSIVE BRUCELLOSIS CONTROL WITHIN YELLOWSTONE NATIONAL PARK THROUGH CAPTURE, TEST, AND REMOVAL

This alternative would implement an aggressive three-year capture and test program for all bison in the park, including those in its interior. Those testing negative would be released in the park, and seropositives would be shipped to slaughter. If a safe and effective vaccine was available, seronegative bison would also be vaccinated. Bison would not be allowed outside the park anywhere in Montana, and agencies would maintain northern and western boundaries. Bison at these boundaries would be hazed back into the park if possible, but shot if they were unresponsive to hazing. Capture facilities would be set up in nine areas. All untested bison would be shot in the latter stages of the capture, test, and slaughter program. When subsequent testing indicated brucellosis had been eradicated from the

bison population, a new bison management plan would be prepared.

ALTERNATIVE 6: AGGRESSIVE BRUCELLOSIS CONTROL WITHIN YELLOWSTONE NATIONAL PARK THROUGH VACCINATION

This alternative, like alternative 5, would pursue the aggressive reduction of brucellosis from the Yellowstone bison herd. However, the entire bison herd would first be vaccinated (when a safe and effective vaccine was available), primarily through remote means, and tested as they attempted to exit at park boundary locations. When tests showed the incidence of exposure to *B. abortus* had stabilized as a result of vaccination, (estimated to occur in 10 years) the herdwide capture, test, and slaughter of seropositive bison outlined in alternative 5 would begin.

Unlike alternative 5, bison would be allowed in the Eagle Creek/Bear Creek and western SMAs, although the majority of bison in the western SMA would be tested and released seronegatives. The National Park Service would construct and operate a capture facility at Seven-Mile Bridge inside the park on the west side. Nearly all bison migrating toward the West Yellowstone area cross through this narrow area. These facilities (at Duck Creek and the Madison River) would be dismantled, although a small, backup capture facility near Horse Butte, might be maintained.

ALTERNATIVE 7: PREFERRED ALTERNATIVE – MANAGE FOR SPECIFIC BISON POPULATION RANGE

The preferred alternative departs from all other alternatives in that a range of bison population numbers would be the focus, and specific management scenarios would be put in place as the population approached either end of that range. This range would be from 1,700 to 2,500 bison. Agency controls would decrease as the bison population approached 1,700 and would cease at 1,700 bison in certain areas as described in management sections for each area. Additional measures to remove increasing numbers of bison would be implemented near the 2,500 mark if bison left the park or SMAs described in this alternative. Because bison removals occur at or outside the park boundary, the bison population could at times exceed 2,500 inside the park.

In the long term, the agencies might acquire access to additional winter range in the Gardiner Valley on the west side of the Yellowstone River through purchase of grazing rights, easements, or property from willing sellers. If acquired, this tract would be designated an SMA subject to the approval of the state of Montana as specified by Montana law. The capture facility now located at Stephens Creek could be dismantled and moved to an appropriate location in the SMA. No modifications in grazing allotments or acquisitions of property, easements, or grazing rights in the western SMA would be anticipated.

Although the preferred alternative (alternative 7) is distinct, it has elements similar to other alternatives. Capture and slaughter of seropositives would be the primary means of managing risk, as it is in alternatives 1, 4, and 5. Most seronegative bison would be shipped to quarantine, as described in alternative 4. Also like alternative 4, low levels of hunting would be allowed in one or more of the SMAs outside the park. As in alternative 3, the preferred alternative has a long-term phase that proposes the acquisition of winter range north of the park boundary. However, as described above, this alternative is much more specific in defining a population size and management tools to keep it at that size. It is also true that alternatives 1 through 6 are unique, as each emphasizes a particular strategy to manage bison or combination of strategies not analyzed in alternative 7.

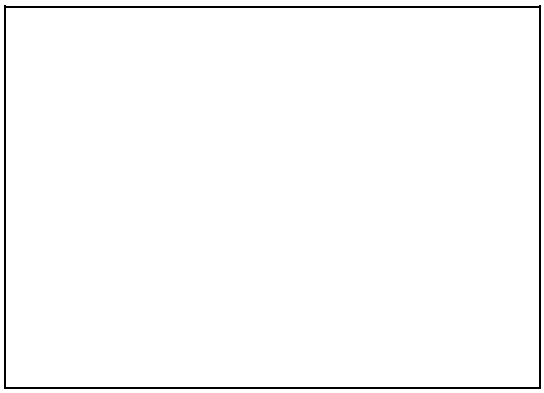

Photo 3: *Stephens Creek capture facility.*

IMPACTS ON BISON POPULATION

A simple model based on averages (deterministic) was used to predict changes in bison populations and/or seroprevalence rates should a given alternative be implemented. Because a single severe winter, such as the 1996–97 winter, could alter estimates of bison numbers significantly, the analysis also includes a section on the effects of small, average, and large-scale migrations out of the park in response to these "stochastic" events on the population size.

The deterministic model predicts the continued implementation of alternative 1 would result in a growing bison population. From 1997 to 2006, the bison population would increase at 4% per year to approximately 3,100. Management actions in this alternative would not measurably affect the age/sex distribution or reproductive rates of bison in this or any alternative except for alternative 5. Bison distribution outside the park is indicated in chart 1. In this, and all other alternatives except alternative 5, 100–200 bison would freely range on public lands in the Eagle Creek/Bear Creek area.

Alternative 2 would result in the largest and fastest growth of the bison population of all alternatives. From 1997 to 2006, the population is expected to increase to 3,500, moderately more bison (14%) than in alternative 1.

Alternative 3 would result in growth of the bison population, with numbers controlled primarily through hunting. From 1997 to 2006, the bison population would be expected to increase from about 2,200 to 3,500 (average increase 6%/year). Limited capture operations, agency shooting, hunting, and periodic severe environmental conditions would likely maintain the bison population near the upper management range of 1,700 to 3,500. It is estimated that alternative 3 would result in moderately more bison in the population (14% increase) compared to alternative 1.

In alternative 4, bison population numbers would be controlled through capture, shipment of seropositive bison to slaughter, and hunting. This alternative would result in a slowly increasing bison population with lower population numbers than alternatives 1, 2, 3, or 6. From 1997 to 2006, the bison population would be expected to increase from about 2,200 bison to 2,800 (average increase 3%/year). This would be a minor decrease (8% lower) in bison population size relative to alternative 1.

For alternative 5, the bison population would be expected to decline from 2,200 bison to approximately 1,250 bison by 1999. The bison population would be expected to number approximately 2,000 by 2006, and approximately 2,900 bison by 2011, 10 years after capture, test, and slaughter operations have ceased. No bison would be expected in Reese Creek, Eagle Creek/Bear Creek, or West Yellowstone in this alternative. The bison population would experience a major decrease in this alternative, representing a nearly 47% reduction, compared to alternative 1, over a period of only three years.

No bison would be allowed anywhere outside Yellowstone National Park boundaries under alternative 5. Management actions in alternative 5 could affect the age/sex distribution or reproductive rate of the bison population. Bison distribution within the park would likely be affected, and several areas would likely have few or no bison for as long as 10 years.

In alternative 6, all bison would be vaccinated for approximately 10 years (beginning in the year

2000) to reduce seroprevalence in the population. After whole herd vaccination, bison would be captured, tested, and seropositives slaughtered, similar to alternative 5. Two different estimates of population size were calculated based on the effectiveness of the vaccine. Assuming a 70% effectiveness, the bison population would be expected to increase during the vaccination phase from 2,200 bison to approximately 3,500 bison in 2010, a negligible to minor increase compared to alternative 1. After 10 years of vaccination (2010), capture and slaughter would begin, and the population would drop from 3,500 to about 2,900 in a single year, a moderate (17%) decrease compared to alternative 1. If the vaccine was only 25% effective, the population would drop from 3,500 animals in 2010 to 2,500 the following year, when parkwide capture and slaughter began. This would represent a major short-term adverse impact (28% reduction) on the population. The herd would begin to increase following completion of the test and slaughter program; from 2,900 to 3,400 bison by 2014 (assuming 70% effectiveness), or from 2,500 to about 3,000 animals (assuming 25% effectiveness) by 2014.

Unlike other alternatives, in alternative 7 the agencies would attempt to manage the bison population within the more narrow range of 1,700 to 2,500 animals. Given the mix of management tools described above in "The Alternatives," the model predicts the bison population would be expected to increase from about 2,200 bison to 2,700 (average increase 2.6%/year) in 2004, and level off at or about 2,700 throughout the remainder of the 15-year plan. This alternative would result in a bison population 12% lower than alternative 1 in 2006 and 23% lower in 2011. However, because of limitations with the deterministic model, the differences between alternatives 1 and 7 might be less. Slaughter, quarantine, agency shooting, and hunting are predicted to remove an average of 132 to 137 bison per year. If bison exited the park in larger numbers during severe winters, more would be killed if the bison population was near or above 2,500 animals. During mild winters, fewer bison would exit the park and thus fewer bison would be killed.

Stochastic Influence on Bison Population

Chart 2 indicates how alternatives would vary in handling a large migration (975 bison) out of the park in response to a stochastic or periodic event, such as severe winter weather. Additional removals might include shipment of seronegative bison to slaughter or quarantine, or additional agency shooting or increases in the number of hunting permits issued, and would depend on the bison management tools available in a given alternative. Each action assumes all elements of the alternative would be in place (e.g., phase 2 of the alternative).

Seroprevalence Rate

Modeling efforts for this environmental impact statement assumed 50% seroprevalence in the bison population. The model also assumed either a 70% rate of effectiveness of the bison vaccine (based on current success with cattle) or 25% rate of effectiveness (based on effectiveness in bison calves). Bison calves were assumed to be vaccinated with a safe and effective vaccine beginning in 2000.

Assuming a vaccine that was 70% effective and calfhood vaccinations began in 2000, the population seroprevalence rate under alternative 1 would be expected to decline from a starting point of 50% seropositive in 1997 to at least 33% seropositive in 2006 (see chart 3). If the vaccine was 25% effective, seroprevalence was predicted to drop from 50% to 40% by 2006. Continued management efforts and calfhood vaccination (assuming 70% efficacy) would reduce seroprevalence to 24% in 2011.

In alternative 2, the population seroprevalence rate would be expected to decline to at least 34% seropositive in 2006 (assuming 70% efficacy) or to 42% by 2006 (assuming 25% efficacy). Continued management efforts and calfhood vaccination (70% efficacy) would reduce seroprevalence to 26% in 2011. This would represent a minor adverse impact (3% to 8% less reduction) compared to alternative 1.

Chart 1: Population Changes Predicted to Occur Using Deterministic (Averaging) Model

Alternative	Population Size (1997)	Population Size (2006)	Population Size (2011)	Number of Bison in Western SMA	Number of Bison in Reese Creek SMA
1	2,200	3,100	3,500	18–52	0
2	2,200	3,500	3,500	20–60	0–120
3	2,200	3,500	3,500	16–120	60–80
4	2,200	2,800	3,200	1–52	0
5	2,200	2,000	2,900	0	0
6	2,200	3,100	2,900	22–60	0
7	2,200	2,700	2,700	13–51	0–100

Chart 2: Number of Bison Slaughtered, Hunted, Quarantined, and Ranging in Special Management Areas if 975 Bison Were to Leave the Park (Represents 90% of the Highest Number of Bison to Historically Leave the Park - 1,084)

Alternative	Slaughtered	Hunted	Quarantined	Additional Removals[a]	Total Removed	Number Ranging in SMAs
1	829	0	0	0	829	146
2[b,c]	0	0	0	0	0	975
3[b]	0	60–70	0	705–715	765–785	200
4[b]	498–823	20	331–6	26	875	100
5	975	0	0	0	975	0
6	810	0	0	65	875	100
7[b]	166	20	23	566	775	200

a. According to the alternative, additional removals might include bison shipped to slaughter, quarantined, hunted, or shot by agency personnel.
b. Assumes all elements of the alternative were in place (phase 2).
c. If 975 bison were to exit the park, the possibility exists that some bison might move onto private land or attempt to move beyond SMA boundaries and be shot, if hazing were unsuccessful. Predicting the total number of bison that may move beyond the boundaries of the SMAs and be shot is not possible, but it might likely be greater than zero.

Chart 3: Predicted Seroprevalence Rates for Each Alternative Using Deterministic (Averaging) Model

Alternative	Seroprevalence 2006 (assuming 70% efficacy)	Seroprevalence 2006 (assuming 25% efficacy)	Seroprevalence 2011 (assuming 70% efficacy)
1	33	40	24
2	34	45	26
3	36	45	28
4	34	42	26
5	0	0	0
6*	32	40	0
7	32	40	23

* For both vaccine efficacies, seroprevalence would be 0% after completion of capture, test, and slaughter operations by 2013.

In alternative 3, the population seroprevalence rate would be expected to decline to at least 36% seropositive in 2006, assuming a 70% vaccine efficacy. With calfhood vaccination and a vaccine efficacy of 25%, seroprevalence was predicted to drop to 45% by 2006. Continued management efforts and calfhood vaccination (70% efficacy) would reduce seroprevalence to 28% in 2011. This would be a minor to moderately higher seroprevalence (9%–17% higher) than that predicted for alternative 1.

In alternative 4, capture and removal of seropositive bison, and calfhood vaccination (70% efficacy) was predicted to decrease seroprevalence to at least 34% in 2006 and 26% in 2011. Assuming a 25% vaccine efficacy, seroprevalence would drop to 42% by 2006. This would be a minor adverse impact (3%–5% higher seroprevalence) compared to alternative 1.

In alternative 5, the seroprevalence rate in bison would be expected to drop from 50% in 1997 to 0% in 2001, assuming 70% vaccine efficacy, capture, test, slaughter operations, and whole-herd vaccination. In the 25% vaccine efficacy model the seroprevalence rate dropped to 0% by 2001. This would be a significant decrease in the seroprevalence rate and a major beneficial impact compared to alternative 1.

In alternative 6, the seroprevalence rate would remain similar to alternative 1 during the vaccination phase (2000–2010), and then drop to 0% by 2013. This would be a major reduction in seroprevalence compared to alternative 1.

In alternative 7, the population seroprevalence rate would be expected to decline from a starting point of 50% seropositive in 1997 to at least 32% seropositive in 2006 due to removal of seropositive bison leaving Yellowstone National Park in the West Yellowstone and Reese Creek area, and calfhood vaccination (70% efficacy) beginning in 2000. Continued management efforts and calfhood vaccination (70% efficacy) would reduce seroprevalence to 23% in 2011. With calfhood vaccination and a vaccine efficacy of 25%, seroprevalence was predicted to drop from 50% to 40% by 2006. This would be a negligible to minor beneficial impact (0–4% lower seroprevalence rate) compared to alternative 1.

IMPACTS ON RECREATION

United States citizens and people from all over the world spend more than 9 million visitor days of recreation in developed sites of the Yellowstone area each year. In Yellowstone National Park, recreational visitation has grown by more than 25% in the last 14 years. As is common in most other western national parks, visitor use in Yellowstone is concentrated in the summer months, with 66% of the visitation in June, July, and August. By the year 2003, estimated visitation is expected to range from 3.6 million to 4.3 million visitors per year (NPS 1994a). An additional nearly 2.8 million recreation visitor days on the adjacent Gallatin National Forest were logged in 1992.

Wildlife and Bison Viewing

When Yellowstone National Park was set aside in 1872 as the world's first national park, the "wonders of the Yellowstone" were the primary motivation — spectacular geysers, colorful hot pools, and the Grand Canyon of the Yellowstone (Meagher 1974). However, in modern times, wildlife viewing is the primary activity for many visitors who come to Yellowstone National Park. Bison are ranked as one of the top 10 animals visitors hope to see on a visit to the park.

Increases and reductions in bison numbers in and around the park could directly affect visitor wildlife-viewing experiences. Alternative 1 would lead to a moderate growth in bison numbers over the next 10 years (42% increase in population by 2006). Alternatives 2 and 3 populations would be 14% greater than alternative 1 populations and lead to a minor to moderate increase in viewing opportunities. Alternative 4 would be expected to result in a population of 2,812 bison in 2006. This is 8% smaller than under alternative 1 and

would lead to a minor decrease in viewing opportunities. Alternative 5 would lead to a 35% decrease in bison populations compared to alternative 1 by 2006 and a moderate to major adverse impact on associated viewing opportunities. Alternative 6 would lead to very similar populations as alternative 1 through 2009 until seroprevalence stabilizes from vaccination (estimated at roughly 10 years), then would reduce them temporarily by 17%, a minor to moderate adverse impact. Alternative 7 calls for the lowest long-range (15+ years) bison population of all the alternatives. By 2006, the population would be nearly 23% lower. These reductions in population size would likely lead to minor to moderate reductions in bison viewing opportunities relative to alternative 1.

Winter Recreation

Winter use in the park has been growing at an accelerating rate, nearly doubling in the decade between 1984 and 1994, to 140,000 in the 1994–95 winter season. An estimated 46% of winter visitors liked viewing the scenery most, and 17% specifically identified wildlife viewing as what they liked most about the park in the winter (NPS 1990b). In addition, snowmobiling has become a popular sport in the town of West Yellowstone.

Winter recreational use of Yellowstone National Park would be affected under alternatives 2, 5, and 6. Alternative 2 would lead to long-term closure of winter access to the park from the popular snowmobiling town of West Yellowstone and possibly restrict access from Mammoth to the park interior. Proposed alternative 2 road and trail closures would likely affect well over 50% of current winter oversnow visitors to the park, and either displace their activities to other roads and trails in the area or cause them to go to areas other than Yellowstone for winter recreation. Alternative 2 would likely have a minor to moderate effect on winter recreation users in the Yellowstone region. During the three to four years of capture and slaughter operations, alternative 5 would have a higher negative impact on winter recreation than alternative 2 in that the west, north, and east entrances would all be cut off from winter access to the popular Old Faithful area. For the first 10–12 years alternative 6 would have similar negative impacts on winter recreation to alternative 2. During the following two to three years, the impacts on winter recreation under alternative 6 would be similar to those for the capture and slaughter period of alternative 5.

Hunting

The five-week elk general rifle season in the study area takes place in late October and November. Mean harvest of elk in and near the affected environment is 3,044. By comparison, deer harvest is 2,564, moose is 93, bighorn sheep is 22, mountain goat is 10, and pronghorn is 23.

The American bison is a trophy animal for big-game hunters. Bison hunting takes place on both public lands and private game ranches in North America. Private ranches charge relatively high prices (ranging from $2,250 to $4,000 in the Northern Rocky region) for hunting a trophy-sized bull.

Limited hunting of bison would be allowed under alternatives 3, 4, and 7. Under alternative 3 between 75 and 85 bison hunting permits would be issued per year. Under alternative 4 the number of permits would be approximately 35. Under alternative 7 between 25 and 35 permits would be issued. This change in hunting opportunities in the area would represent a minor increase in overall big game hunting in the Greater Yellowstone Area, but would be a minor to moderate benefit for those receiving permits. No hunting of bison would occur under alternatives 1, 2, 5, or 6.

IMPACTS ON LIVESTOCK OPERATIONS

In the Yellowstone area, the livestock industry is composed mainly of cow-calf operations with the exception of a few sheep producers. Cow-calf pairs are grazed on national forest allotments that

can include adjacent private land, and on private holdings not associated with grazing allotments. In addition to risks of disease transmission, bison can harm livestock, as well as damage structures.

To the north of Yellowstone National Park, grazing allotments located in the broadest area included in this environmental impact statement have about 434 cow-calf pairs on national forest land and about 191 pairs on adjacent private land included as part of the allotments. When only the Reese Creek area is considered, cow-calf pairs on national forest land number about 86, with about 130 pairs on allotted private land. In the West Yellowstone area, about 364 cow-calf pairs are grazed on national forest land in the Horse Butte and Wapiti areas. An additional 128 pairs (and 2 pairs on allotted private land) are found on allotments to the west and south of Hebgen Lake.

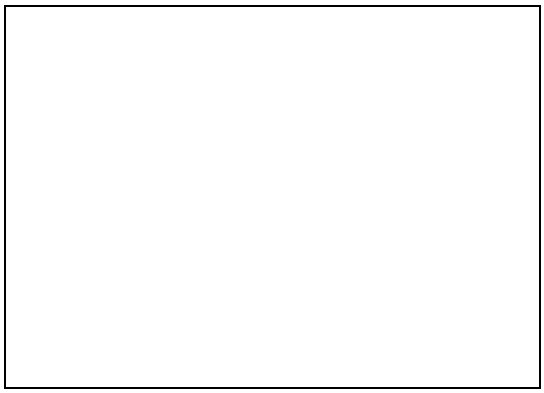

Photo 4: *Cattle near Whitehall, Montana, by G. Wunderwald. (NPS photo)*

Privately owned lands that are not part of allotments include both livestock holdings and nonranch residences. North of Yellowstone National Park, the largest of the livestock operations is in the Reese Creek area on the Royal Teton Ranch. It has about 100 cow-calf pairs on unallotted private land, in addition to 150 on allotted private and public land.

In the West Yellowstone area, there are four private holdings located in the Horse Butte region between Duck Creek and the Madison River, totaling about 1,250 acres. Only the largest, with an area of about 650 acres, has a summer cattle operation with about 215 cow-calf pairs.

Including producers to the west and south of Hebgen Lake, there are an estimated 800 cow-calf pairs on private land in the West Yellowstone area that could be directly affected by the most extensive of the SMAs (alternative 2).

Altogether, publicly and privately grazed cattle to the north and west of Yellowstone that could be directly affected are estimated to total about 2,019 cow-calf pairs. They comprise less than 4% of the cattle population of Gallatin and Park Counties.

The impacts of brucellosis on livestock operations involve not only the area adjacent to Yellowstone National Park, but also producers throughout Montana. The threat of disease transmission and the economic effects of disease-exposed bison entering the state have potential impacts that could indirectly affect all producers in the state.

Under alternative 1, cattle producers near Yellowstone National Park currently take precautions against the threat of brucellosis by vaccinating all female calves. In addition, herds from Idaho that graze in the West Yellowstone area are tested both when entering and leaving Montana. The cost of vaccinating and testing is relatively minor, estimated at about 2% of average yearly cow-calf production costs in the western United States. Producers' perceptions of the potentially negative consequences of grazing near Yellowstone National Park underlie recent decisions by two purebred stock owners to no longer graze their cattle in the area.

Alternative 2, characterized by minimal bison management, would involve modification of grazing allotments on the national forest, acquisition or easement of private lands, and conversion of cow-calf operations to steer or spayed heifer production. In the short term, until these changes are accomplished, the interim plan would continue. Public funds would be required for compensating producers who agreed to convert their operations and for acquiring the title or use of the private properties. These transactions would be voluntary with fair remuneration. Nevertheless, they would represent

major impacts for the producers involved. Modification of public grazing allotments could affect as many as 926 cow-calf pairs. Incidents of damage by bison would be similar to occurrences under alternative 1 until susceptible cattle were removed from the areas designated as SMAs. Afterward, incidents would be fewer, since the only cattle would be those on converted holdings. Producers near SMA boundaries would likely continue to vaccinate female calves.

Under alternative 3, testing and vaccinating would continue as under the interim plan (alternative 1) in the short term. In the long term, modifications in grazing allotments on the national forest as described under alternative 2 would reduce the need for vaccinating and testing, but within less extensive SMAs. Producers near SMA boundaries would likely continue to vaccinate female calves. Whereas about 2,019 cow-calf pairs are found within the areas designated to be SMAs under alternative 2, the smaller areas of alternative 3 contain about 895 cow-calf pairs. Moderate to major impacts in the long term for these herds would result from possible conversion to steer or spayed heifer enterprises, closure or modification of grazing allotments, and private land acquisitions. Hunting could provide a minor source of income for remaining converted holdings.

Alternative 4 differs from alternative 1 in that bison hunting would be allowed. Hunting in the West Yellowstone area could provide a minor source of income for some private holdings.

Under alternative 5, livestock operators in the vicinity of Yellowstone National Park would likely perceive a reduced disease threat because no bison would be allowed outside the park. Restriction of bison to the park would lessen concerns over brucellosis transmission, although vaccination of cattle could continue, especially in the short term. Relaxation of testing practices in the West Yellowstone area would depend on changes in Idaho's agreement with Montana. Private grazing resources might increase in value due to reduced risks of disease spread and damage by bison. Thus, the overall impact on affected livestock producers could be moderately beneficial.

Consequences of alternative 6 with respect to testing and vaccinating would be the same as in alternative 1 during the first years of vaccination of Yellowstone bison. Once capture, test, and slaughter of bison were undertaken, consequences for livestock producers would be like those of alternative 5, although seronegative bison would be allowed on public land in the West Yellowstone SMA. Cattle vaccination would probably continue, depending on producers' risk perceptions. Continued testing of herds in the West Yellowstone area would depend on Idaho's agreement with Montana. In the long term, moderate benefits overall would be realized under this alternative, as under alternative 5.

SMAs under phase 1 of the preferred alternative (alternative 7) would be the same as they are now under the interim plan (alternative 1). Testing and vaccinating would continue, as would possible incidents of damage by bison within the boundaries of the SMAs. No modifications of livestock operations would occur under phase 1. In phase 2 (following acquisition of winter range north of the Reese Creek boundary), impacts could affect at least one private holding and could modify three public grazing allotments along the western side of the Yellowstone River in the Gardiner Valley.

In addition to direct impacts on local producers outlined above, ranchers throughout the state could suffer from increased testing or vaccinating requirements or interstate sanctions should brucellosis be transmitted to Montana cattle. The possibility of such transmission and associated indirect impacts would be considered remote in all alternatives, although it would be slightly less in alternative 5, slightly greater in alternative 2, and roughly equal in the remaining alternatives.

IMPACTS ON SOCIOECONOMICS

Regional Economy

The affected area primarily encompasses two Montana counties, Park and Gallatin, and portions of Yellowstone National Park.

Throughout the Greater Yellowstone Area, public lands provide the basis for much of the economic activity in the region (recreation, mining, forestry, and agriculture). The area's overall economy has been changing for more than 20 years. The economy has shifted from commodity-extraction dependence to a more diversified economy based on recreation, tourism, and service industries. For example, between 1969 and 1989, more than 96% of all new jobs in the Greater Yellowstone Area came from sectors other than timber, mining, and agriculture (Rasker, Tirrell, and Kloepfer 1992).

Approximately 10% of Park County employment and 5% of Gallatin County employment is in the agriculture, forestry, and mining sectors. In addition, some component of employment in manufacturing, wholesale and retail trade, and services is derivative of activity in these resource-based sectors. Most jobs pertaining to the recreation and tourism industry are found in the retail trade and service sectors of a county's economy.

Recreation and tourism are significant to the economic viability of the area. Retail trade and services accounted for approximately 40%–45% of each county's earnings. These sectors, along with the government sector, have a strong tie to the region's resources and would likely continue to be important in sustaining segments of the economy of the Greater Yellowstone Area.

The alternatives described in this environmental impact statement would have the potential to affect jobs and income primarily through changes in visitation levels to Yellowstone National Park. Visitation levels could be affected by changes in winter road grooming, changes in wildlife viewing as a result of lowered population levels of bison, or in response to tourism boycotts. Visitors to Yellowstone National Park from outside Montana, Wyoming, and Idaho spent an average of $840 during their trips (Duffield 1992).

Expenditures Related to Recreation. A 1994 report on snowmobiling in Montana found nonresidents spend approximately $40 million annually in the state, and three-fourths of those nonresidents spent time in or near West Yellowstone (Sylvester and Nesary 1994). If alternative 2, which would include closing roads now groomed for snowmobile use from West Yellowstone into the park was implemented, the annual loss in winter tourism expenditures in the town of West Yellowstone could be between $656,000 and $2 million. Under alternative 5 these regional annual losses could be $1.8 million to $3.2 million during the three to four years of road plowing (to pavement, and therefore unavailable for snowmobile use) for the capture and slaughter operations. Alternative 6 could lead to expenditure losses similar to those under alternative 2 for the first 10–12 years, and similar to those under alternative 5 for the next two to three years. The loss under all these alternatives would be substantially higher if not for considerable snowmobiling opportunities on the nearby national forest. Losses of winter recreation expenditures under alternatives 1, 3, 4, and 7 would probably be negligible. The adverse impacts on winter recreation expenditures under alternative 2 could be more than offset by positive impacts on visitation related to wildlife viewing (see below). The adverse impacts on winter recreation expenditures under alternatives 5 and 6 would be in addition to adverse impacts on visitation related to wildlife viewing.

Resident elk hunters spent $54 per day while resident deer hunters spent $41 per day. Nonresident hunters expenditures associated with elk and deer hunting are $252 and $115 per day, respectively (Duffield 1988). Expenditures related to bison hunting in alternatives 3, 4, and 7 would add to this base, by as much as $440 per day. Since a maximum of 85 hunting permits for any alternative would be expected, expenditures

related to it would be only a negligible benefit to the regional economy.

Expenditures Related to Wildlife Viewing. Alternatives 2 and 3 would increase bison viewing opportunities, and alternatives 5, 6, and 7 would reduce them. The beneficial impact on the regional economy from alternatives 2 and 3 from increased visitor expenditures could be $20 million in annual park area visitor spending. Conversely, the adverse impact from alternatives 5, 6, or 7 could be $20 million in lost revenues from tourism.

The management of bison would involve killing through agency shooting, transport of sero-positive animals to slaughter, hunting, and other actions that some would find objectionable. People who do take offense might object for any number of reasons: e.g., the killing of any animals is inappropriate, human management of wildlife is not needed, or bison do not need to be controlled to prevent brucellosis transmission from bison to cattle. All alternatives would involve bison management, and thus each would have some potential for adverse public reaction that might result in the call for a tourism boycott, although the potential would likely vary among alternatives. The potential for such a call and the effectiveness of such a boycott would be difficult to judge.

Minority and Low-Income Populations

As of the 1990 U.S. census, Park County had a per capita income of $11,378, approximately equal to that of the state of Montana. Gallatin County had a substantially higher income level of $17,032 per person. The percentage of the population in poverty across the two counties and the state was relatively consistent in 1990 at between 15.2% and 17.1%. Unemployment in the two counties in 1994 was below the state average of 5.1% (Park County, 4%; Gallatin County, 2.3%).

Montana's Native American population had a much lower per capita income ($5,422) than either the two counties or the state, a much higher percentage of population living in poverty (46.1%) than the counties or the state, and an unemployment rate (26.2%) much higher than the counties or the state.

Several area tribes have expressed interest in receiving bison carcasses, or, more importantly, live bison as seed stock from the Yellowstone herd to begin their own bison operations. Bison meat sells for nearly twice the cost of beef because it is considered a health food by some consumers.

Under the interim management plan, a total of 1,084 bison were killed outside the park in Montana in 1996–97. Of this total, 590 bison were shot on the spot and donated to charities or released to Native Americans in exchange for the labor of gutting, cleaning, and transporting carcasses. Charities received 77 bison, and Indian tribes, tribal members, and affiliated organizations received 513 bison (State of Montana, C. Siroky, pers. comm. 1997).

Alternatives 1, 3, 4, 5, 6, and 7 all would include slaughter and the distribution of carcasses, and all alternatives would include provisions for shooting bison if they crossed boundary lines (and the subsequent gutting, cleaning, and distribution of carcasses, hides, and heads). The estimates for numbers of bison to be sold or donated for consumption would range from an incidental number per year in alternative 3 to 720 over four years under alternative 5. These numbers would represent a very minor portion of the total U.S. annual market for bison meat. The impact of charitable donations or release of carcasses to tribes would generally be negligible.

The release of live bison would require quarantining captured seronegative bison for the completion of a lengthy quarantine protocol. Quarantine facilities would be proposed for alternatives 3, 4, and 7, and live bison completing the procedure would be available to tribes and other requesting organizations. Live animals received after quarantine would have substantially more value to tribes than would carcasses.

Social Values

Bison are symbolically an icon for the independent, wild, and free American way of life, and are considered by some people to be "a unique symbol of the strength and determination of the people of North America" (National Bison Association 1997a).

Bison embody the culture of many native Plains peoples. They are a link to the spiritual world, spiritual power concentrated in physical form, the "great provider," and ultimately a symbol of power and strength. Bison skulls are used as altars, bone is used on traditional dress, and they are at the heart of the continuing sun dance.

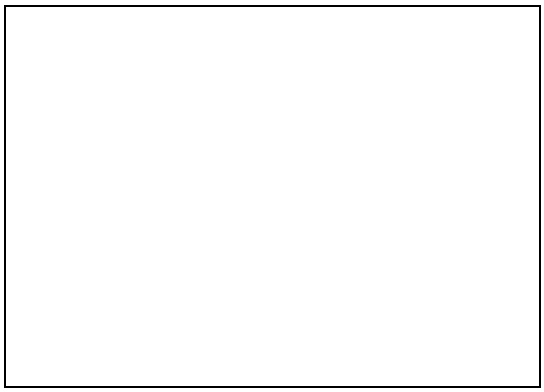

Photo 5:

Bison are important to other groups as well. To hunters, they are a trophy animal; to cattle ranchers, bison have historically represented competition with livestock for limited forage; and to many animal rights activists, they are an aesthetic and historic resource.

Written comments collected from the *Interim Bison Management Plan/Environmental Assessment* in 1995 indicated the public was strongly against the slaughter of bison. Ranchers also indicated strong feelings on the need to protect cattle from brucellosis. These are moralistic-humanistic and utilitarian values, respectively. No systematic surveys have been conducted, but it appears that alternatives relying on slaughter (1, 4, 5, 6, and 7) would have a minor to major adverse impact on those having strong moralistic-humanistic values toward animals.

Attitudes in the Yellowstone region would be more balanced between utilitarian and other attitudes than in the nation as a whole (based on wolf recovery information). Native American values may be more complex, as many of the management actions are viewed as disrespectful or wasteful of bison.

Nonmarket Values

People place value on knowing a species is maintained in a viable state or has been augmented in some way. In a study involving elk winter range north of Yellowstone National Park, those surveyed found the benefit of a land purchase to benefit elk far outweighed actual land acquisition costs. This "nonmarket" or "existence" value applies to bison as well, and although no studies specific to bison were conducted, alternatives 2, 3, and 7 could potentially have large nonmarket value benefits associated with expansion of bison winter range, on the order of $1.6 to $22.9 million annually. Additional nonmarket values attributable to the opportunities to view natural wildlife populations, or for recreational opportunities, could also be in the millions of dollars.

Social Cost-Benefit

From a social cost-benefit perspective, alternatives 2, 3, and 7 would have the potential to range from a moderate negative to a major positive impact, while alternative 4 would likely have a minor adverse to negligible impact compared to alternative 1. Alternative 5 would likely have a major adverse impact, and the impact on alternative 6 could range from minor to moderate adverse.

From a regional economic perspective, alternatives 2, 3, and 4 would likely have a negligible to minor positive impact, while alternatives 5 and 6 would have a minor to

moderate adverse impact. Regional economic impacts under alternative 7 would be expected to range from a moderately adverse effect to a minor positive impact.

IMPACTS ON THREATENED, ENDANGERED, AND SENSITIVE SPECIES

Peregrine falcons, bald eagles, grizzly bears, and gray wolves are the only known species to occur within the affected area that are protected by the Endangered Species Act. Wolverine, lynx, and trumpeter swan, USFS sensitive species, could also occur in the affected area. These species could be directly affected by bison management actions, such as shooting, hazing, or habitat loss or modification. Because bison are an important food source, predatory species could also be indirectly affected by reduced foraging opportunities caused by changes in bison numbers, distribution, and seasonal migration patterns.

Peregrine Falcons

The alternatives would have no effect on peregrines because bison management activities would not occur near active aerie or foraging areas, and because they do not feed on bison carrion.

Bald Eagles

Alternatives 5 and 6 would negatively affect bald eagles that winter and nest near Seven-Mile Bridge because of the location of a capture facility in this area. Other bald eagles in the analysis area would be protected by avoiding their nesting and wintering areas. Change in bison carrion availability would have a negligible effect because it is only a small part of the bald eagle diet.

Grizzly Bears

All alternatives could potentially disturb or displace grizzly bears from areas near bison management activities. The alternatives would affect only a small part of the Greater Yellowstone Grizzly Bear Recovery Zone, an area where seasonal or year-long grizzly activity is common and contains habitats important to the recovery of grizzly bears. Denning bears would not be affected during the winter when most activities would occur. Under alternatives 3, 4, and 7, increased human activity could increase the probability for human/bear conflicts and bear mortality. This probability would be reduced to negligible by educating hunters, removing gut piles, and implementing other mitigating measures.

The degree to which an alternative modifies bison population numbers could likewise affect grizzly bears. Bison, along with other ungulates, rank as one of the highest sources of net digestible energy for grizzly bears in the Yellowstone ecosystem. Data indicate that 32% of all meat in the diet is carrion, and most of that is from adult bison. Bison are particularly important to bears because they provide a high quality food source during early spring before most vegetal foods are available to bears. Grizzly bears that den in the Pelican and Hayden Valleys in the park depend on bison carrion and are most likely to be affected by changes in bison populations.

Under alternative 1, bison numbers would not be maintained within a specific range, and low population levels could result during some periods. Consequently, foraging opportunities could be reduced during some years and negatively impact grizzly bears, particularly during the spring. This impact would likely be negligible unless bison disappeared from Pelican or Hayden Valleys in the park. Alternative 2 would allow the bison population to reach a long-term maximum of 3,500 bison quickly, and would leave park roads ungroomed, which would likely increase winter bison mortalities and carrion in the park. This would increase the availability of bison as a food source and moderately benefit grizzly bears. Alternative 3 would have minor benefits. Alternatives 4, 6, and 7 would maintain the bison populations within a specific range and cause only minor changes in the population. Thus, the impacts on grizzly bear foraging opportunities

would be negligible. Alternative 5 would cause a major decrease in the first few years in the bison population and reduce the carrion supply available to grizzly bears.

Gray Wolves

The Rocky Mountain gray wolf was reintroduced in Yellowstone National Park in March 1995 and is part of a "nonessential experimental population." This means that the species is listed and protected under the Endangered Species Act, but agencies have additional flexibility in their management. To date nine packs are in the Greater Yellowstone Area, mostly in the park. Some individuals and packs have made exploratory movements outside the park, but none is resident outside the park.

All alternatives could disturb or displace wolves from areas near bison management activities. However, any impact on the small wolf population would likely be negligible.

Wolves prey primarily on elk, moose, and deer. These species are abundant in the analysis area, and usually account for more than 90% of the biomass consumed. Smaller mammals may be an important alternative food during the snow-free months. Wolves rarely prey on live bison, but do eat bison carrion if it is available. Although wolves could eventually increase their take of bison as prey as the wolf population increased, impacts from changes in the bison population during the 15 years this plan was in effect would be negligible in alternatives 1, 3, 4, 6, and 7. Alternative 2 would have a moderate beneficial impact and alternative 5 a moderate to major adverse impact to wolves through larger-scale changes in bison population numbers.

On December 12, 1997, the United States District Court for the District of Wyoming ruled that the gray wolf reintroduction program in Yellowstone National Park and northern Idaho violated one provision of the Endangered Species Act. The court ordered the federal government to remove the reintroduced wolves and their offspring. The court stayed the effect of the order pending appeals. Because the decision is on appeal, this document considers the gray wolf as a permanent component of the study area. Should the decision be upheld on appeal and the wolves were removed, impacts on the gray wolf would not be an issue associated with bison management under the alternatives analyzed.

Wolverine and Lynx

Both wolverine and lynx are very susceptible to human activities, and wolverines readily abandon den sites when disturbed. All the alternatives could displace or disturb wolverine and lynx from areas near bison management activities. Under alternatives 2, 5, and 6, snowmobile use now on the groomed trails inside the park would be displaced to trails and off-trail areas in the neighboring Gallatin National Forest where wolverine and lynx occur. Lynx are specialized predators that may face competition from generalist predators given access to their habitat by following packed-snow routes such as those resulting from snowmobile use. Winter recreation activities would be monitored on the national forest and, if necessary, mitigating measures implemented to protect the wolverine and lynx. Changes in bison numbers would have a negligible impact because wolverine and lynx seldom feed on bison carrion.

Trumpeter Swans

Trumpeter swans could be affected by the location and operation of bison management facilities. The swan occupies meadows and open fields, plus lakes, ponds, or slow-moving water inside the park on the Madison River. In particular, a breeding pair at Seven-Mile Bridge where a capture facility is proposed in alternative 6, would experience major adverse impacts from construction and operation.

IMPACTS ON OTHER WILDLIFE SPECIES

Ungulates

The Stephens Creek capture facility occupies 13 acres of critical pronghorn winter range, and has had adverse impacts on the antelope population through displacement, disturbance, and blocked movements. Observations from capture operations during winter 1996–97 showed pronghorn avoided using habitat in the capture facility area, and some pronghorn may have been confused by the wing fences when fleeing from predators. The capture facility at Stephens Creek would continue to exist in all alternatives except alternative 2 (in the short term only in alternatives 3 and 7), and would have a moderate to major adverse impact on the pronghorn population. Other capture facilities, such as those in West Yellowstone and planned for different locations within the park in alternatives 5 and 6, could have minor adverse impacts on wildlife through displacement and disturbance.

Potential acquisition of additional wildlife winter range in the Gardiner Valley, a part of alternatives 2, 3, and 7, would make more winter habitat available to elk, mule deer, bighorn sheep, and particularly pronghorn. This would be a minor benefit to most ungulates and a moderate to major beneficial impact on pronghorn.

Occasional hazing operations associated with all alternatives would be expected to have minor impacts on elk, mule deer, bighorn sheep, and other ungulates through disturbance and temporary displacement.

In alternatives where snowmobile use would be displaced outside the park (alternatives 2, 5, and 6), impacts on ungulates outside the park could be more intense than they are now. This is because snowmobiles would be restricted to trails inside the park, but allowed to travel off trails in many areas of adjacent public lands.

Elk, pronghorn, deer, bighorn sheep, and moose would not likely be affected through competition for forage or space with bison, as each has an ecological niche that differs from bison through food choices, occupied habitat, or tolerance of snow depth. Therefore, increases or decreases in the bison population size would not be expected to affect any other large ungulates.

Predators and Scavengers

Hazing activities directed at moving bison into capture facilities or inside the SMA boundary could disturb and displace predator and scavenger species, including black bear, mountain lion, coyote, fox, wolverine, bobcat, lynx, and a variety of smaller mammalian and avian carnivores and scavengers using those areas. Hazing should be infrequent, however, and displacement and stress would be local and temporary and would have only minor effects on those populations. Changes in the bison population size and resulting availability of carrion would not affect predators and scavengers except during the parkwide capture and slaughter phases of alternatives 5 and 6, when reductions would be severe enough to cause a moderate impact. Displaced snowmobile use associated with alternatives 2, 5, and 6 might affect some of these species more severely than at present, as this activity is restricted to trails inside the park and might not be if it was displaced outside the park. Impacts on some species could be moderate.

IMPACTS ON HUMAN HEALTH

Brucellosis is a zoonotic disease that can infect people, causing undulant fever. Symptoms include intermittent fever, chills, night sweats, body and joint pain, poor appetite, and weakness. The general public would be at no risk of contracting the disease from bison. However, people responsible for carrying out proposed bison management actions such as capturing, vaccinating, gutting, loading for slaughter, and laboratory analysis, could be at moderate risk. Hunters could also be at some risk. Recipients of auctioned or donated meat could be at minor risk of exposure through the handling of potentially

contaminated meat and the consumption of improperly prepared meat. Proper handling and cooking completely kills the bacteria.

Mitigating and preventive measures, such as proper equipment, ventilation, and information, would prevent impacts from being more than negligible to minor in all alternatives except during the parkwide capture and slaughter phases of alternatives 5 and 6, when the risk would be minor to moderate.

IMPACTS ON CULTURAL RESOURCES

The Great Plains and the northern Rocky Mountains of western Montana and Wyoming served as feeding grounds for bison. This region is also the homeland of various native peoples who hunted these herds.

Bison were critical to the indigenous cultures of North America and were an important part of the landscape covering over half the continent. They once ranged from the Appalachian Mountains to the "deserts" of the Great Basin south into Mexico and as far north as the Yukon territory in Canada. English settlers arriving in what is now Georgia wrote of the "innumerable" bison they encountered. The numbers were so great that early Euro-American explorers could only describe them as "numberless," and wrote that the plains were "black and appeared to be moving" with the herds of bison. The most commonly used estimates of their numbers were between 30 and 65 million.

Bison provided not only food, clothing, fuel, tools, and shelter, but also were central to Plains tribal spiritual culture, viewed as an earthly link to the spiritual world. For many tribes, bison represent power and strength. For example, the Shoshone believe that spiritual power is concentrated in the physical form of the bison. Many contemporary tribes maintain a spiritual connection with bison. Today, the InterTribal Bison Cooperative describes itself as "tribes proudly serving the buffalo nation," indicating respect and a sense of equality and direct spiritual connection.

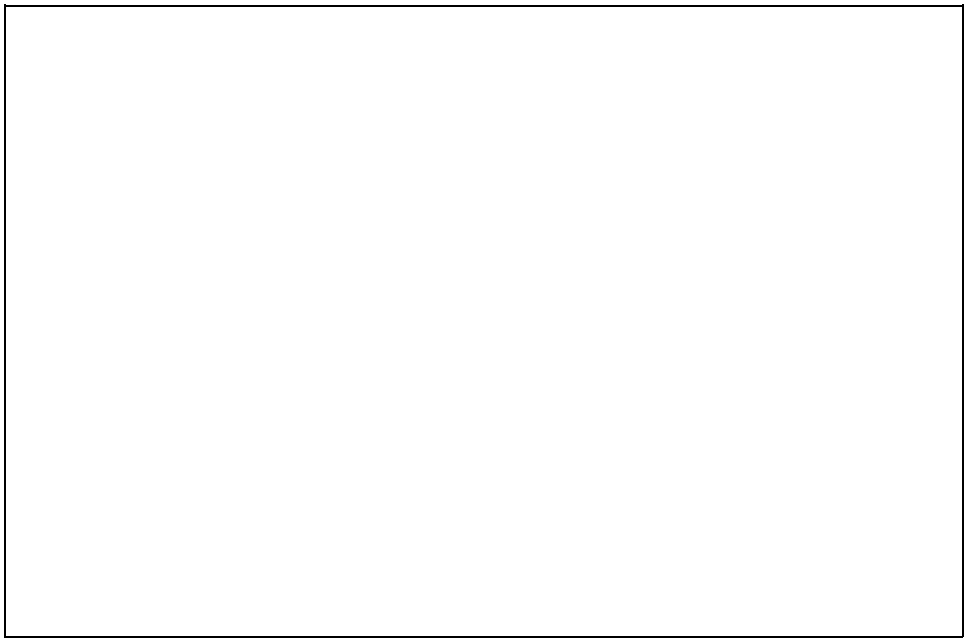

Photo 6: *Illustration entitled "By the Millions" by Martin S. Garretson, 1913. (NPS photo)*

Traditional use of bison by humans centers on hunting and is evidenced in the archeological record. The remains of game drives, including both the fences and bison jump sites, as well as chipping stations, wickiups, and weapons, are all associated with the importance of hunting bison for tribal economy and culture.

Most archeological sites in the Yellowstone area have not been evaluated according to the National Register of Historic Places criteria, although Obsidian Cliff, an area particularly rich in cultural remains, has been nominated as a national historic landmark. Several others, including the Yellowstone road system, one archeological site in the Stephens Creek area, and one archeological site in the Eagle Creek area, are considered to be eligible for inclusion in the national register.

In all alternatives, bison would be killed while occupying their historic range. Reductions in the population size compared to the no-action alternative (alternative 1) would occur on a short-term basis in alternatives 5 and 6, might occur on a short- term basis in alternative 4, and would occur on a long-term basis in alternative 7.

In all alternatives except alternative 2, the process of monitoring and vaccinating bison would change their appearance. Bison would be marked with visible metal ear tags, paper back tags, and paint/peroxide stripes to indicate to managers and others that they have tested negative for the *Brucella* organism. These actions alter the historic image of the bison and would have a temporary, moderate impact on the historic landscapes.

The construction of new capture or quarantine facilities would have the potential to affect archeological resources. In all alternatives proposing construction of bison management facilities (all except alternative 2), site-specific surveys would be conducted prior to ground-disturbing activities, and every effort would be made to avoid known archeological resources. Should avoidance prove impossible, the National Park Service, U.S. Forest Service, and state agencies would develop mitigating measures in consultation with the state historic preservation officer and the advisory council. Therefore, the impact would likely be minor.

Removal of the capture facility at Stephens Creek, as proposed in alternative 2, would have a beneficial impact on the historic landscape. The construction of several new capture facilities in alternatives 5 and 6 would have a temporary but significant adverse impact on the historic landscape of Yellowstone National Park.

IMPACTS ON VISUAL RESOURCES

Visual resources consist of landform (topography and hydrology) and land cover (vegetation, buildings, roads, etc.). Visual resources are centered on significant features and intrinsic features. Also included is visibility of the undertaking, such as exposure and location.

The Greater Yellowstone Area is world renown for its scenery, wildlife, wilderness, rivers, fishing, hunting, outdoor recreation opportunities, and geologic and thermal features. The natural landscape is rugged and formidable due to the rapid gains in elevation, and most of the area remains in a wilderness state. Bison and other wildlife are frequently observed meandering through the landscape.

Visual resources within Yellowstone National Park fall into two general zones — the natural zone and the park development zone. Bison are observed within both, although they are most frequently observed within the natural zone.

Vehicle pullouts in the park are designed for visitors to stop and experience the visual resources, and are placed in areas where bison are most frequently found — e.g., valley lowlands off the main loop roads. Some locations include the open areas within Hayden Valley, Old Faithful/Firehole area, the Madison River (past Seven-Mile Bridge), Indian Creek in the Mammoth area, the Norris Campground, Gibbon Meadows, Elk Park, and others. The view from these pullouts includes an unobstructed natural setting containing habitat desirable to bison as well as other wildlife species.

The process of capturing and/or vaccinating bison would temporarily change their natural appearance. Bison would be visibly marked with tags and peroxide stripes due to vaccination and testing procedures. These processing marks would detract from the natural appearance of the animal. This would be a short-term, moderately adverse impact on the viewer, photographer, and anyone interested in seeing bison. Capture would be a part of all alternatives except phase 2 of alternative 2.

Agency shooting of bison and some hazing operations would be visible if bison ventured beyond delineated management areas. Hunting of bison outside the park in designated SMAs is also part of alternatives 3, 4, and 7. These bison management actions would have a minor to major short-term (winter only) visual impact on the landscape, or on some viewers, who might be opposed to shooting, hunting, or hazing bison, or might be sensitive to these activities.

The existing capture and test facility would continue to intrude on the viewshed at Stephens Creek in all alternatives except alternatives 2, 3, and 7. Because this facility is of a compatible design with the nearby Yellowstone National Park wrangling facilities, the impact on visual resources would be minimal. Also, this facility would not be readily visible to the majority of visitors to the park and surrounding areas.

Capture and test facilities within the viewshed on the western boundary of Yellowstone National Park would continue to adversely impact visual resources in alternatives 1, 4, 6, and 7. The visual impact of capture facilities at West Yellowstone would be minor to moderate. These facilities would not be visible in major viewsheds, but some park visitors, national forest users, and local residents would see them. Bison management actions, such as hazing, shooting, and gutting, could be a major adverse visual impact on some of these viewers. Construction of capture and testing facilities in the Seven-Mile Bridge viewshed near the western boundary of the park in alternative 6 would be a major impact on visual resources.

The proposed construction of capture and test facilities within Yellowstone National Park at the Lamar Valley/Crystal Bench, Blacktail Plateau, Madison River, West Yellowstone boundary area, Old Faithful/Firehole River, and Hayden Pelican Valleys, which is part of alternatives 5 and 6, would have a major impact on visual resources. These areas are highly sensitive to visual intrusions, and while measures would be taken to minimize impacts, the presence of these facilities would be highly noticeable.

A quarantine facility is part of alternatives 3, 4, and 7. Although the location or design of a quarantine facility for bison has not been determined, the facility would probably appear as large-scaled corrals and pens within which bison would be visible. Siting of a relocated capture facility and a new quarantine facility would be sensitive to views and features of the viewshed; therefore, impacts are expected to be minor.

In alternatives 2, 3, or 7, grazing allotments might be modified and could cause negligible to minor changes in the rural landscape near park boundaries. In the long term, cattle grazing would be modified in some allotments on lands adjacent to Yellowstone National Park, and the scenery would change to views of bison and wildlife habitat.

Changes in the size of the bison population would affect viewers. Some would find increased opportunities to view bison a benefit; others opposed to wildlife management policies would be adversely affected.

Alternatives 2, 5, and 6 include provisions for closing roads to snowmobile traffic. This would help restore the winter visual scene inside the park to a more natural one, but would adversely affect visual resources on adjacent Gallatin National Forest where much of the snowmobile traffic would be displaced.